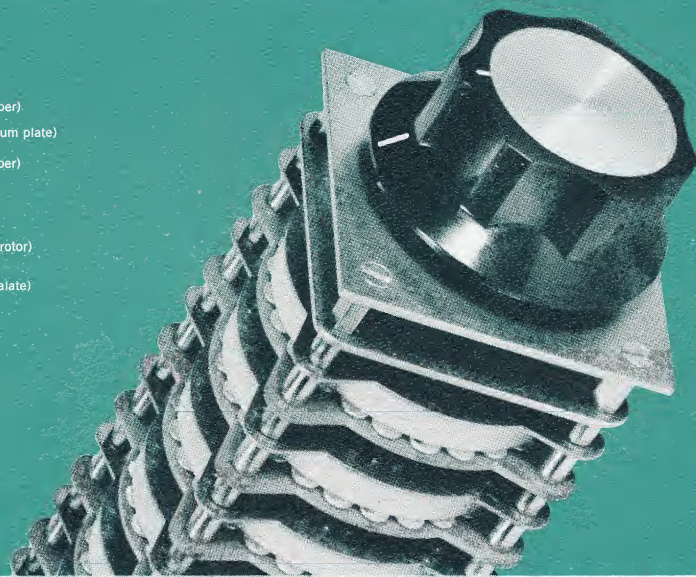
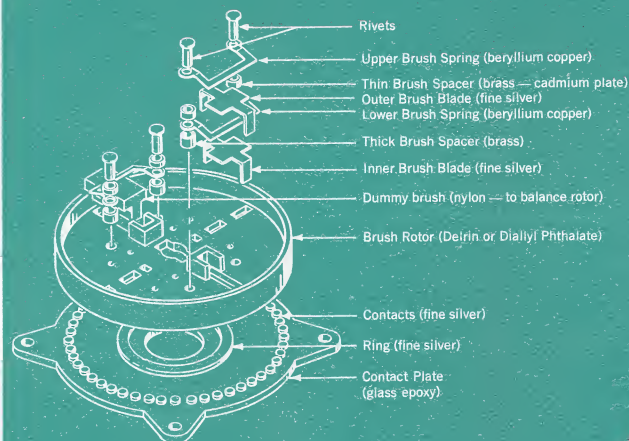


ALTEC ROTARY PRECISION SWITCHES

**ROTARY
PRECISION
SWITCHES**



Altec Rotary Precision Switches
are THE choice for use in

Dual Adjustable Stops
Recording Consoles
Laboratory Equipment
Telemetry Applications
Audio Engineering Uses
Computers
Television Studios
Testing Applications
Sound Reinforcement Systems
Remote Controls
Radio Broadcasting
Motion Picture Studios
Communication Systems
Program Circuits
Missile Support Equipment
Radar Systems
Geophysical Surveying Equipment
Teaching Machines
Photography Laboratory Equipment
Precision Equalizers
Thermocouple Switching

... in fact, in any application
where precise switching
action is required.

Incorporating the latest design techniques and employing the finest materials, Altec Rotary Precision Switches combine extreme reliability with wide versatility. Specifically, each Altec Switch is a product of diligent attention, and each is constructed to order with the customer in mind... to fulfill his needs... to solve his problems... to satisfy his requirements... be it a simple single-deck, single-pole switch, or a complicated multi-deck, many-pole device.

Among the advancements featured in Altec Rotary Precision Switches are:
the principle of dual, nested, independently suspended brushes...
the use of fine (pure) silver in all contacts, brushes and rings...
and the application of Altec's exclusive universal coupling.

The fundamental components of any switch are those which compose the electrical path; those parts of the control which change the signal from one circuit to another. Altec has developed a new approach to this basic area: dual, nested, independently suspended brushes. This new technique permits signal paths to be switched without contact noise, and with exceptionally low resistive and inductive changes. The smooth, precise action found in Altec Switches makes brush 'bounce' and 'stumble' obsolete.

The entire electrical path of Altec Switches—contacts, brushes and rings—is made from pure silver, providing the shortest path with the lowest resistance possible. Each brush is a single piece of silver.

The long shafts used in most multi-deck switches are known for their tendency to bind. Altec Rotary Precision Switches use a universal coupling and a flat extension shaft to minimize this binding problem. The universal coupling eliminates the need for a single long shaft, and the extension shaft, moveable in two directions, is firmly held in the rotational plane. Therefore, binding is eliminated and mechanical misalignment is minimized.

Altec Rotary Precision Switches are available with a variety of optional features. Brush rotor may be either Delrin or Diallyl Phthalate. Detents, if desired, are available in a modified hill-and-dale or in a 'soft' audio configuration. Mounting facilities on the small size switch are offered in either center hole or mounting plate form. Optional knobs and dials are available as are terminal boards.

And Altec Switches may be ordered in an abundant variety of poles, positions, decks, indexing angles, and types... making it possible to solve almost any switching problem.

DESIGNED TO MEET MIL S 3786B SR-14 and SR-15



A Division of **SPV** Ling Altec, Inc.

**1515 S. Manchester Ave., Anaheim, Calif.
New York**

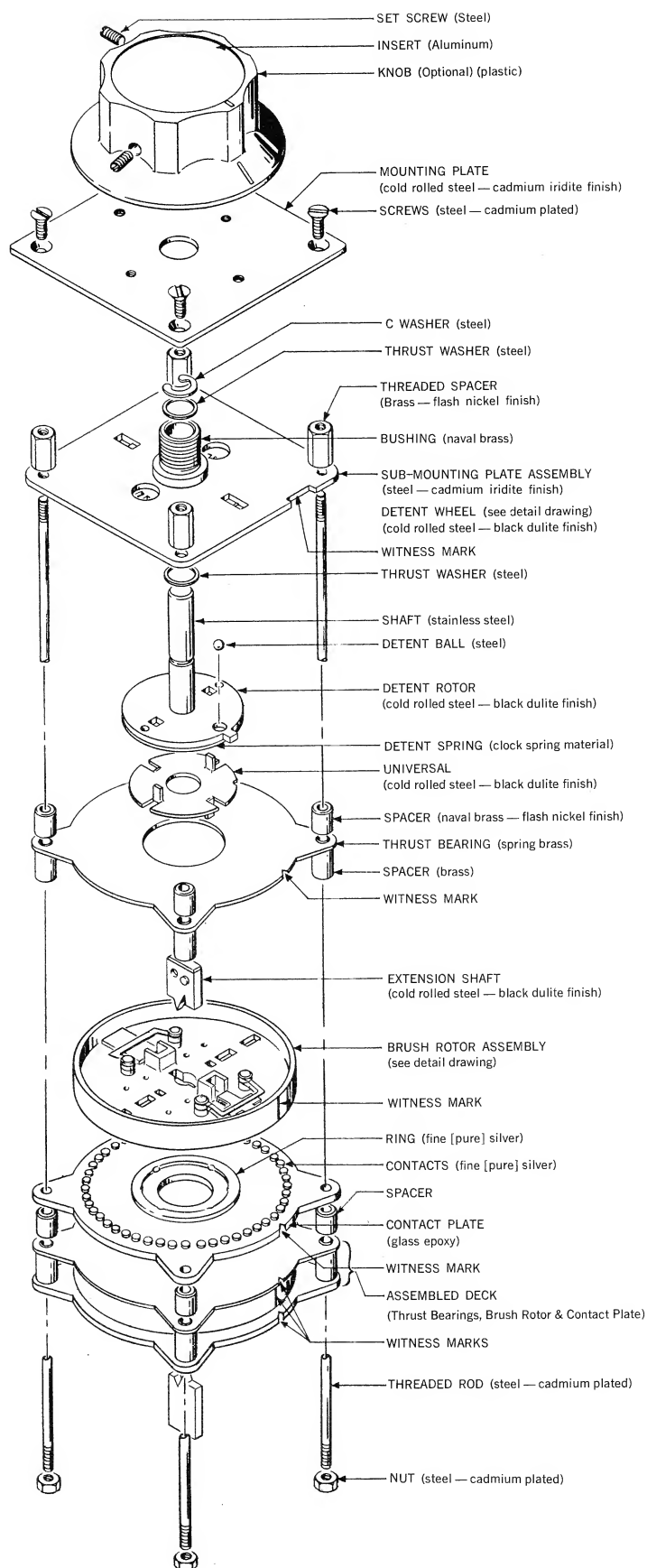


FIGURE 1 — Exploded View of an Altec Rotary Precision Switch

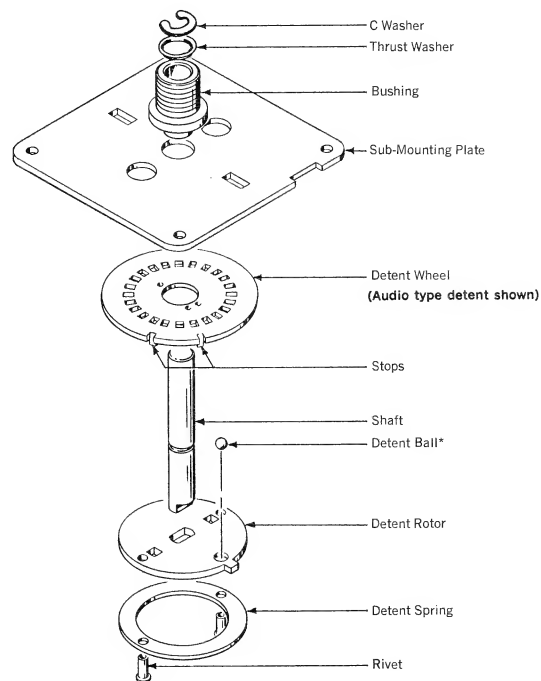
ALTEC PRECISION ROTARY SWITCH

The exploded view of an Altec Precision Rotary Switch (Figure 1) not only illustrates the details of construction and materials, but also demonstrates the ease with which the switch may be disassembled and reassembled to facilitate wiring connections, etc. Upon reassembly the switch will comply exactly with its original alignment.

The plastic knob (optional) attaches to the shaft of the detent rotor assembly, passing through the sub-mounting plate assembly (Figure 2). The detent rotor assembly (of the audio hill-and-dale type in this illustration) is joined to the extension shaft through the exclusive Altec universal coupling. This device couples the base of the detent rotor assembly to the brush rotor assembly; permitting precise coupling to ensure firm action and yet provide a freedom of movement.

Contained within the brush rotor assembly (Figure 3) are provisions for up to four poles (two poles in the small size switch). The extension shaft continues through the brush rotor assembly and the contact plate to operate as many as nine additional decks within a single switch (more on special order).

Materials used in Altec Precision Switches have been selected to augment the operation, protection and purpose of the unit. Cadmium iridite finish serves to protect the steel parts from corrosion. Black dulite, another corrosion preventative, is used to finish cold rolled steel components. Naval brass facilitates the use of the bushing (although high speed operation is not recommended). The thrust bearing is made from spring brass and the brush springs are beryllium copper, both materials selected because they are considered the best commercial choice for the purpose they serve. Delrin, fine (pure) silver, and contact plate materials are described in conjunction with the section on the Brush and Spring Assembly detail, page 3.



*If the C washer is removed, care should be taken to avoid loss of the detent ball which may drop out of place as the detent spring-rotor-shaft assembly is slipped out of the bushing.

FIGURE 2 — Sub-Mounting Plate Assembly and Detent Rotor Assembly

SUB-MOUNTING PLATE ASSEMBLY — DETENT ROTOR ASSEMBLY (See Figure 2.)

Directly under the mounting plate is the detent wheel. It is on this wheel that stops are provided. The balanced detent ball, held captive in the detent rotor, rides the hill-and-dale configuration of the wheel. A detent spring holds the ball in place and assures precise detent action. (Figure 2 illustrates standard hill-and-dale detenting. A modified hill-and-dale type detenting with adjustable stops is available optionally.)

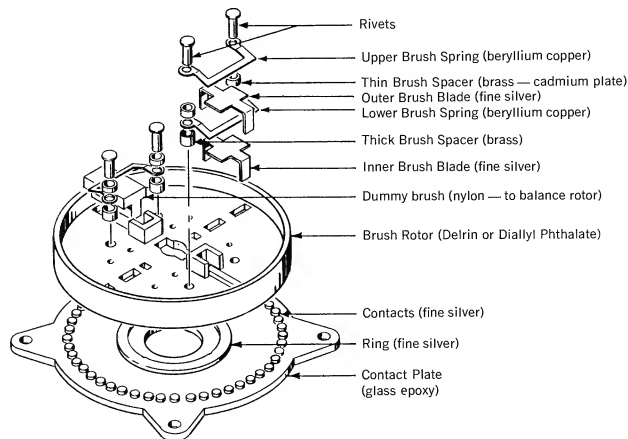


FIGURE 3—Brush and Spring Assembly and Contact Plate

BRUSH AND SPRING ASSEMBLY AND CONTACT PLATE (See Figure 3.)

Components of the brush and spring assembly are housed within a 'Delrin' brush rotor. Delrin acetal resin, a crystalline form of polymerized formaldehyde, is a new engineering plastic which has high fatigue endurance, tensile strength, and rigidity. Other outstanding characteristics of Delrin are: high resistance to corrosion, creep resistance over a wide range of temperature and humidity conditions, and resiliency for applications requiring springiness and toughness. Electrical characteristics of Delrin are shown in Figure. 5. Where temperatures in excess of 125°C. are expected, a Diallyl Phthalate rotor is available.

The brush and spring assembly, which consists of two springs, two brush blades, spacers and rivets, is installed within the brush rotor by a special system of dual, nested, independent suspension. Two brush assemblies may be mounted in one rotor of a small switch, and up to four in the larger unit. The upper brush spring holds the outer brush in position and, in turn, the lower brush spring retains the inner brush. This suspension system permits the two brush blades to ride the contacts and the ring(s) with precision previously impossible. The suspension system prevents any brush 'bounce' because both the mass and the spring tension of each brush differs. Therefore, the chance of a simultaneous 'bounce' from both brushes is improbable. A slot in the brush rotor provides a guide below the point of suspension to prevent brush 'stumble'.

ALTEC SWITCH TEST RESULTS				
Test	Ring to Frame	Ring to Contacts	Contacts to Frame	Between Contacts
Insulation Resistance	5000 megohms	19,000 megohms	9800 megohms	6000 megohms
High Voltage — 1500 volts RMS, 60 cps applied for 1 minute	OK	OK	OK	OK
Capacitance	40 pfd*	5 pfd**	5 pfd***	5 pfd
Resistance (from contact through brush to ring) — 0.0005 ohms				
Inductance (from contact through brush to ring) — 0.019 microhenry at 257 mc. Q = 70.				
*brush set at contact nearest spacer				
**to open contact with brush set at closest contact to open contact				
***with contact nearest frame open				
All tests made at normal room temperature and humidity. Tests made on 2 1/4" switch with 48 contacts at 7 1/2" spacing (contact spacing: 0.03")				

Thermal EMF less than 1 μ V/°C
Current carrying capacity — 10 amperes
Current switching capacity — 1 ampere @ 28 volts
Life exceeds 100,000 rotations
Switch without detent (used as attenuator) life exceeds 2,000,000 rotations
With detent — 500,000 rotations

FIGURE 4 — Table of Switch Test Results

DELTRIN PROPERTIES	
Property	Average Value*
Water Absorption 24 hrs. immersion equilibrium 50% R.H., 77° F	0.25%
equilibrium immersion 77° F	0.2%
	0.9%
Dielectric Constant 50% R.H., 73° F, 10 ⁶ -10 ⁸ cps	3.7
Dissipation Factor 50% R.H., 73° F, 10 ⁶ cps	0.0048
Dielectric Strength, Short Time	500 V/mil
Volume Resistivity 73° F and 0.2% water	6 x 10 ¹⁴ ohm/cm
Surface Resistivity 73° F and 0.2% water	10 ¹⁶ ohm
Arc Resistance Flame extinguishes itself when arcing stops	(burns — no tracking) 129 seconds on 15 mil specimen
*Values are representative of those obtained under standard American Society for Testing Materials standards and should not be used to design parts which function under different conditions.	

FIGURE 5 — Table of Delrin Properties

ALTEC GLASS EPOXY PROPERTIES	
Property	Value
Water Absorption 1/8" Method ASTM (D:570) Condition: E-1/105; D-24/23; T-23/50	0.04%
Dissipation Factor at 10 ⁶ cps Method ASTM (D:150) 23°C, 50% R.H.	0.017%
Dielectric Constant at 10 ⁶ cps Method ASTM (D:150) 23°C, 50% R.H.	4.2
Volume Resistivity Method ASTM (D:257, D:1371) C-96/35/90, T-35/90	5 x 10 ¹⁶ megohm-cm
Surface Resistivity Method ASTM (D:257, D:1371) C-96/35/90, T-35, 90	10 ¹⁷ megohms

FIGURE 6 — Table of Altec Glass Epoxy Properties

The entire electrical path — brushes, contacts and rings — is made from fine silver. Fine silver is **pure** silver; that is, it contains no impurities or alloys which can depreciate the performance characteristics of the metal. Fine silver has the lowest resistivity of any known metal. The use of fine silver in the Altec design provides the switches with the shortest possible physical and electrical path. Contact resistance in an Altec switch is less than 1.0 milliohms and remains exceptionally uniform from contact to contact, and upon return to the same contact, shows less than 0.05 milliohms variation. Although other conductors such as copper will oxidize and generate noise voltages, silver undergoes a chemical change which produces silver sulfide. Because silver sulfide does not affect resistivity, does not rectify, and does act as a lubricant,

the operation and performance of an Altec Rotary Precision Switch (see Figure 4) actually is enhanced over a period of time. Brushes and contacts running dry will exceed 2,000,000 cycles without noticeable wear.

CONTACT PLATES

Altec glass epoxy, made with a high-pressure thermo-setting plastic laminate provides an impact strength which is up to five times better than phenolic. Altec glass epoxy, which meets government specification MIL-P-18177-C-GEB, has six times the moisture resistance of phenolic, and approximately twice the dielectric resistance. Properties of Altec glass epoxy are shown in Figure 6.

HOW TO SELECT AN ALTEC PRECISION SWITCH

Upon receipt of the order, each Altec Rotary Precision Switch is assembled individually to the specifications requested by the customer. A large stock of basic components permits a switch to be rapidly assembled to meet any combination of specifications. The customer is assured that each switch is not just an adaptation of an existing device, but a carefully constructed unit meeting his requirements.

However, before the customer can ascertain his needs and determine the specifications required for the assembly of his switch, he must consider certain information regarding the functions and purposes of that switch and its associated circuitry. Some of the specifications to be determined are merely a matter of "with" or "without." Others involve more complex decisions. And nearly all interact to complicate the selection. To set about selecting a switch, start with the matter of...

POLES and POSITIONS

which are determined by the circuitry involved. One pole is required for each circuit to be switched, and the number of positions required is determined by the number of paths into which each circuit is to be channeled. For example, if two circuits are to be switched, then a two-pole switch is required. And if ten paths are required for each circuit, then each pole will need ten positions. The number of positions and poles necessary will help determine the specifications for...

DECKS.

If circuit requirements cannot be met with a single deck switch, additional decks will achieve the necessary requirements by providing facilities to meet the circuit demands. Any switch with more than four poles, for instance, requires more than one deck regardless of the number of positions involved. For a complex switch, a multiple of decks may be necessary. It is possible that a switch with ten decks might contain as many as 40 poles...or that a four-pole switch might require four decks if a sufficient number of positions is necessary. Additional decks permit wider distribution of poles (fewer per deck) and tend to facilitate wiring connections. The number of decks to be used also may depend upon the...

INDEXING ANGLE

desired; that is, the amount of degrees between each position. Generally it is preferable to obtain the widest angle possible. Wide indexing frequently means greater speed in selecting positions and tends to decrease the chance of errors on the part of the operator. Also, the indexing angle should be considered in respect to other controls if the switch is to be used in a console or similar installation. Usually, it is desirable for the indexing angle of all grouped controls to coincide. If the new switch is designed to replace an old one, and if the old

dial is to be maintained, then it is essential that the indexing angle of both switches be identical. Indexing angle (and the number of positions per deck) also will be affected by whether or not the switch is to be...

SHORTING or NON-SHORTING

A shorting switch is a make-before-break type, while a non-shortening switch breaks one connection before the next connection is made. The type of circuitry in which the switch will be used is the major factor in determining which type to select. If it is important that there be no break in the circuit operation, then a shorting type switch will serve the purpose. On the other hand, if the circuit is such that it cannot be connected to another branch circuit, or cannot tolerate different potentials resulting from two contacts being made at one time, then a non-shortening switch will be required. (If it makes no difference, the selection of the shorting type will be less expensive and require less space.)

The number of positions available on each deck is affected by the type of switch. A non-shortening switch will have as many positions as a shorting switch will within the same specifications but a non-shortening type requires a 'dead' (unwired) contact between each 'live' (wired) one. (Detents, of course, will position on every other contact; i.e., on wired contacts only.) Therefore, a two-pole, ten position switch requires a total of 20 contacts if it is a shorting switch, or a total of 40 contacts (every other one wired) if it is non-shortening. The number of positions available also may be decreased if...

STOPS

are desired to limit the rotation of the switch. A large size continuous rotation switch (shorting type) will have a maximum of 48 positions available and up to 36 positions may be accommodated on the small size. Equipped with stops, however, the maximum number of positions available on the small switch is decreased from 36 down to 33. On a non-shortening switch with stops, the maximum number of positions per deck is 16 as opposed to 18 for the continuous rotation version. Switches with adjustable stops are available with indexing of $11\frac{1}{4}^\circ$, 15° , $22\frac{1}{2}^\circ$ and 30° . They are not available in a dual concentric contact plate arrangement. (Note: The use of modified hill and dale detents with adjustable stops will limit the number of indexing angles available. Figures used are for audio type detents unless otherwise indicated.) On the large size switch, the maximum number of positions (shorting type) is reduced from 48 to 45 by the addition of stops. For a large non-shortening switch, the maximum number of positions is 24 (no stops) and 22 (with stops). With an Altec switch,

SIZE

is a matter of 'large' or 'small,' and may be determined primarily by the space available on the proposed console or intended installation. But size is affected by the number of positions and poles required, the number of decks to be employed, the type of mounting desired (center hole mounting is available only on the small size), and the switch type. The small size Altec switch is 1½-inches square, and the large size measures 2¼-inches square; sizes which will accommodate most of all precision rotary switch requirements. Dimensional drawings are shown in Figure 11. The small switch is available with either one or two poles per deck; and the large size will accommodate up to four poles per deck.

DETENTS,

used on the majority of switches, permit precise operation and facilitate the use of a switch by establishing predetermined positions. Detent placement is dependent upon the position of the contacts. Two types of detents are available on Altec switches: Audio type or modified hill and dale with adjustable stops. The audio type detent has a 'soft feel' indexing intended for audio console applications. The modified hill and dale with adjustable stops is a more positive indexing detent intended for heavy duty applications, i.e., Military useage, precision laboratory work, program circuits, etc.

TERMINAL BOARDS

are optional. To facilitate wiring, the customer may prefer a switch which is pre-wired to terminal boards. Up to four boards per deck are available, and circuit requirements will help determine the number of boards (and terminals per board) needed. Representative boards are shown in Figure 13. Space limitations within the console or at the installation should be considered, also. For a complex switch requiring extensive wiring, terminal boards will permit connections to be made more readily. Terminal boards have turret-type terminals mounted on them.

SWITCH TERMINALS

Switches have flat "lug-type" terminals with holes in them as supplied. See Figure 14. "Solder pot" type terminals can be had on special order.

KNOBS AND DIALS

The standard knob supplied with the Altec switch is 2" in diameter, or, if desired, a 1¼" knob is available. The standard dial supplied is 2¾" in diameter but if the smaller knob is selected, a 2¼" dial is available. Dials may be engraved to suit special applications or requirements.

OTHER OPTIONS

are available to the customer. Flats on the shaft will ensure proper orientation of the knob. The length of the shaft may be specified to suit the installation need. Plugs may be selected if this form of connection is preferred. A choice of center-hole or plate mounting is optional for the small size switch only. All large switches are plate mounting.

Once the circuit requirements have been determined, check the Tables on pages 6 and 7 to find the various deck-indexing angle-size combinations available to satisfy those requirements. To illustrate the...

USE OF TABLES

the following example has been selected: two-poles, ten positions, non-shorting with stops.

First, check the non-shorting table (Figure 10). Such a switch would be available as a one-deck switch in the large size with 15° indexing...

LARGE SIZE SWITCHES			
1	22	24	15°
2	11	—	—
1	16	18	20°
2	8 or 16*	18*	—
3	8	—	—
4	8	—	—
1	15	16	22½°
2	7 or 15*	16*	—
3	7	—	—
4	7	—	—
1	11	12	30°
2	5 or 11*	12*	—

Or, in the dual concentric rings and contact rows, with 20°, 22½° or 30° indexing.

LARGE SIZE SWITCHES			
1	22	24	15°
2	11	—	—
1	16	18	20°
2	8 or 16*	18*	—
3	8	—	—
4	8	—	—
1	15	16	22½°
2	7 or 15*	16*	—
3	7	—	—
4	7	—	—
1	11	12	30°
2	5 or 11*	12*	—

To fulfill the same specifications in a small switch requires a two-deck (one pole per deck) unit with ten positions per deck. This version may be had in any of the following indexing angles: 20°, 22½° or 30°.

SMALL SIZE SWITCHES			
Poles Per Deck	Maximum Positions (with stops)	Maximum Positions (continuous)	Indexing Angle
1	16	18	20°
1	15	16	22½°
1	11	12	30°

Returning to the large size table, it indicates that the one pole per deck version (non-shorting) is available in the same indexing angles—plus the 15° angle—to meet the circuit requirements of the example given.

LARGE SIZE SWITCHES			
1	22	24	15°
2	11	—	—
1	16	18	20°
2	8 or 16*	18*	—
3	8	—	—
4	8	—	—
1	15	16	22½°
2	7 or 15*	16*	—
3	7	—	—
4	7	—	—
1	11	12	30°
2	5 or 11*	12*	—

Therefore, it is possible to meet the circuit requirements of the example cited in any of eleven different versions. Assuming that the example must be center-hole mounting, all large sizes (which plate mount only) are eliminated. Referring back to the small size table, there are three possible choices. Since the widest indexing angle obtainable is preferred, the small switch selected is the one with the 30° indexing.

SMALL SIZE SWITCHES			
Poles Per Deck	Maximum Positions (with stops)	Maximum Positions (continuous)	Indexing Angle
1	16	18	20°
2	15	16	22½°
1	11	12	30°

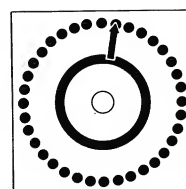
After the physical requirements of the switch have been selected and the other options have been chosen, then the switch may be ordered in accordance with the Ordering Code as explained on Page 10.

SHORTING

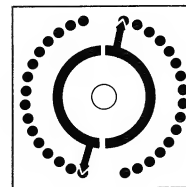
SMALL SIZE SWITCHES			
Poles Per Deck	Maximum Positions (with stops)	Maximum Positions (continuous)	Indexing Angle
1	33	36	10°
2	16	—	10°
1	30 †	32 †	11¼°
2	15 †	—	11¼°
1	23 †	24 †	15°
2	11 †	—	15°
1	20	20	18°
2	9	—	18°
1	18	18	20°
2	9	—	20°
1	16 †	16 †	22½°
2	8 †	—	22½°
1	12 †	12 †	30°
2	6 †	—	30°
LARGE SIZE SWITCHES			
1	45	48	7½°
2	22	—	
1	33	36	10°
2	16 or 33*	36*	
3	16	—	
4	16	—	
1	30 †	32 †	11¼°
2	15 or 30*	32*	
3	15 †	—	
4	15 †	—	
1	23 †	24 †	15°
2	11 or 23*	24*	
3	11 †	—	
4	11 †	—	
1	19	20	18°
2	9 or 19*	20*	
3	9	—	
4	9	—	
1	18	18	20°
2	9 or 18*	18*	
3	9	—	
4	9	—	
1	16 †	16 †	22½°
2	8 or 16*	16*	
3	8 †	—	
4	8 †	—	
1	12 †	12 †	30°
2	6 or 12*	12*	
3	6 †	—	
4	6 †	—	
*Concentric with two rings and two rows of contacts.			

FIGURE 7 — Shorting Switch Table

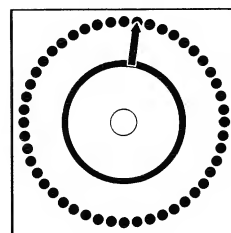
†Indicates adjustable stop switches with modified hill and dale detents.
All other switches are supplied with the audio type detent.



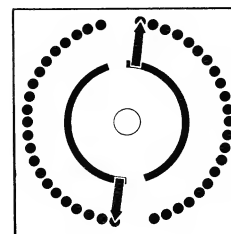
1 POLE — SMALL
SIZE
2 to 33 positions
(with stops)
36 positions
(continuous)
(Minimum Index-
ing Shown — 10°)



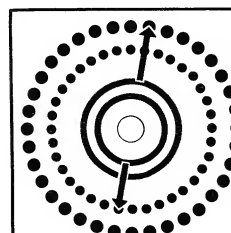
2 POLE — SMALL
SIZE
2 to 16 positions
(Minimum Index-
ing Shown — 10°)



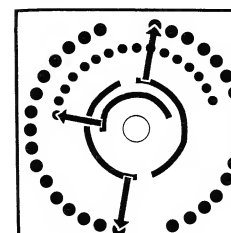
1 POLE — LARGE
SIZE
2 to 45 positions
(with stops)
48 positions
(continuous)
(Minimum Index-
ing Shown — 7½°)



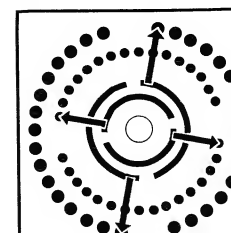
2 POLE — LARGE
SIZE
2 to 22 positions
(Minimum Index-
ing Shown — 7½°)



2 POLE (Concen-
tric) LARGE SIZE
2 to 33 positions
(with stops)
36 positions
(continuous)
(Minimum Index-
ing Shown — 10°)



3 POLE (Concen-
tric) LARGE SIZE
2 to 16 positions
(with stops)
(Minimum Index-
ing Shown — 10°)

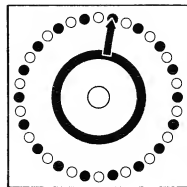


4 POLE (Concen-
tric) LARGE SIZE
2 to 16 positions
(with stops)
(Minimum Index-
ing Shown — 10°)

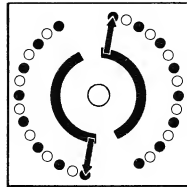
FIGURE 8 — Representative Contact, Brush and Ring Arrangements for Shorting Switches.

NON-SHORTING

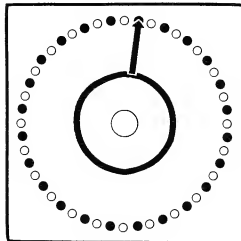
1 POLE — SMALL
SIZE
2 to 16 positions
(with stops)
18 positions
(continuous)
(Minimum Index-
ing Shown — 20°)



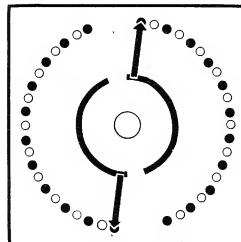
2 POLE — SMALL
SIZE
2 to 8 positions
(Minimum Index-
ing Shown — 20°)



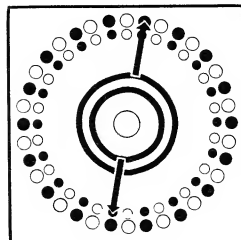
1 POLE — LARGE
SIZE
2 to 22 positions
(with stops)
24 positions
(continuous)
(Minimum Index-
ing shown — 15°)



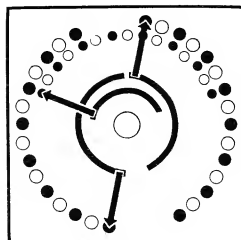
2 POLE — LARGE
SIZE
2 to 11 positions
(with stops)
(Minimum Index-
ing shown — 15°)



2 POLE (Concen-
tric) LARGE SIZE
2 to 16 positions
(with stops)
18 positions
(continuous)
(Minimum Index-
ing Shown — 20°)



3 POLE (Concen-
tric) LARGE SIZE
2 to 8 positions
(with stops)
(Minimum Index-
ing Shown — 20°)



4 POLE (Concen-
tric) LARGE SIZE
2 to 8 positions
(with stops)
(Minimum Index-
ing Shown — 20°)

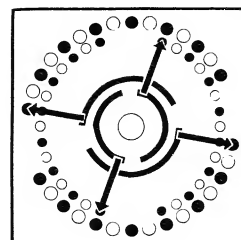


FIGURE 9 — Representative Contact, Brush and Ring Arrangements for Non-Shorting Switches.

SMALL SIZE SWITCHES

Poles Per Deck	Maximum Positions (with stops)	Maximum Positions (continuous)	Indexing Angle
1	16	18	20°
2	8	—	20°
1	15 †	16 †	22½°
2	7 †	—	22½°
1	12 †	12 †	30°
2	6 †	—	30°
1	9	10	36°
2	4	—	36°
1	9	9	40°
2	4	—	40°
1	8	8	45°
2	4	—	45°
1	6	6	60°
2	3	—	60°

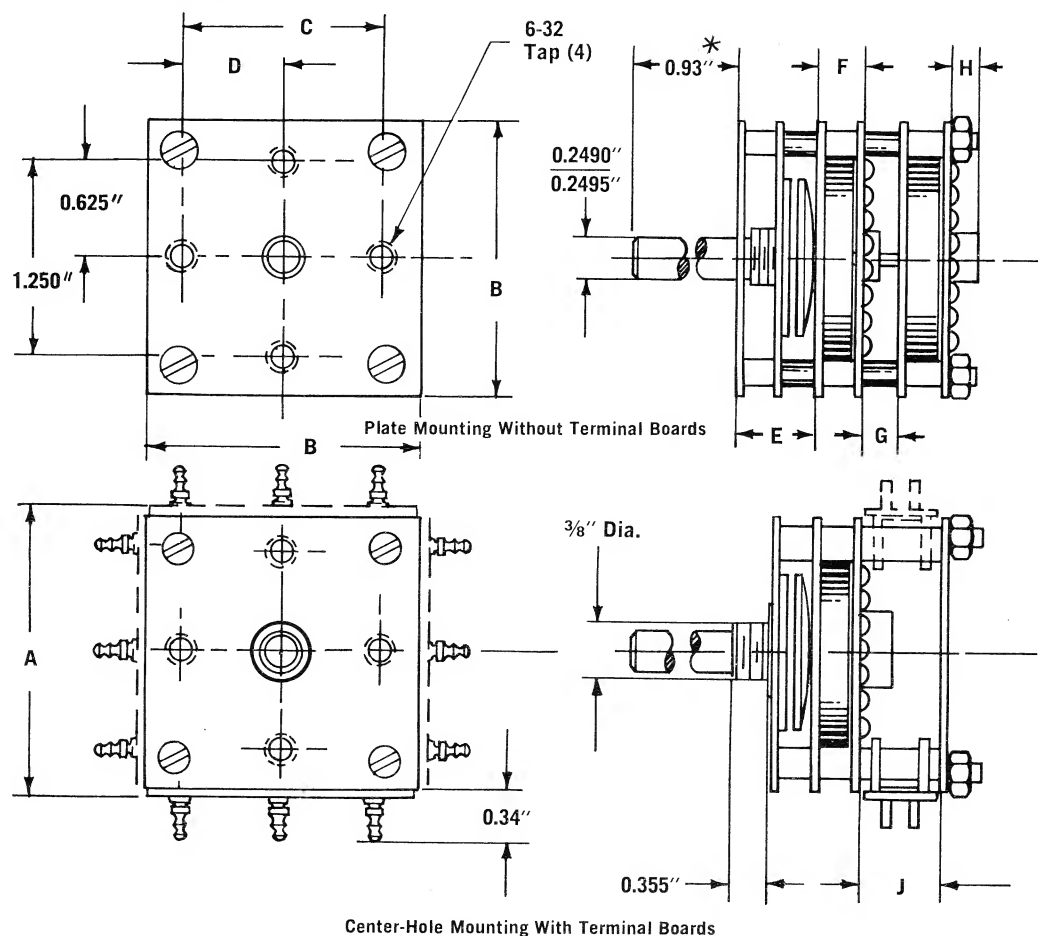
LARGE SIZE SWITCHES

1	22 †	24 †	15°
2	11 †	—	
1	17	18	20°
2	8 or 16*	18*	
3	8	—	
4	8	—	22½°
1	16 †	16 †	
2	7 or 15*	16*	
3	7 †	—	
4	7 †	—	30°
1	12 †	12 †	
2	5 or 11*	12*	
3	5 †	—	
4	5 †	—	36°
1	10	10	
2	4 or 9*	10*	
3	4	—	
4	4	—	40°
1	9	9	
2	4 or 9*	9*	
3	4	—	
4	4	—	45°
1	8	8	
2	4 or 8*	8*	
3	4	—	
4	4	—	60°
1	6	6	
2	3 or 6*	6*	
3	3	—	
4	3	—	

*Concentric with two rings and two rows of contacts.

FIGURE 10 — Non-Shorting Switch Table

DIMENSIONAL INFORMATION



*0.93" is standard shaft length and is measured from the face of the mounting plate or from the C Washer on a center-hole mounting switch. Optional shaft lengths are available on special order.

FIGURE 11 — Dimensional Drawings

Size	Table of Dimensions (in inches)								
	A	B	C	D	E	F	G	H	J
Large	2¼"	2.235	1.500	0.750	0.730	0.425	0.230	0.108	0.750
Small	1½"	1.485	1.250	0.625	0.730	0.425	0.230	0.108	0.750

FIGURE 12 — Table of Switch Dimensions

Dimension B is both the height and width of the switch. If terminal boards are used, add 0.34 inch to each dimension on which a board will be placed. If two boards are to be mounted on opposing sides of the switch, add 0.68 inch to obtain the overall measurement.

The length (depth) of a switch may be determined by use of a formula as follows:

Single Deck Switch (no terminal boards): Shaft length + E + F + H = Total Length.

Multi-Deck Switch (no terminal boards): Shaft length + E + (F × number of decks) + (G × number of decks less one) + H = Total Length.

Single Deck Switch (with terminal boards): Shaft length + E + F + J + H = Total Length.

Multi-Deck Switch (with terminal boards) Shaft length + E + (F × number of decks) + (J × number of decks) + H = Total Length.

The overall length of a switch is the same for plate mounting or center-hole mounting, however, the panel-to-knob dimension changes. For a plate mounting switch, a standard shaft will extend 0.93" minus the thickness of the panel. For a center-hole mounting switch, the bushing length (0.355") minus the thickness of the panel must be added to the shaft length to determine the panel-to-knob dimension.

TERMINAL BOARDS

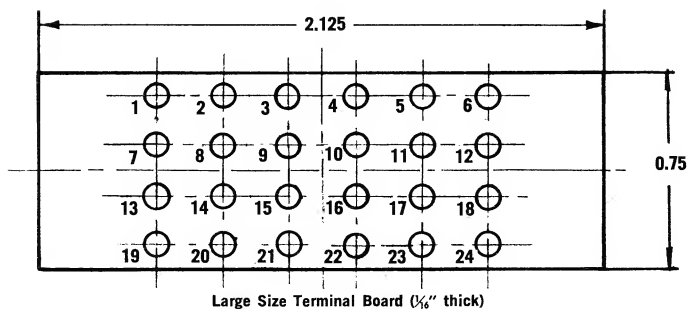
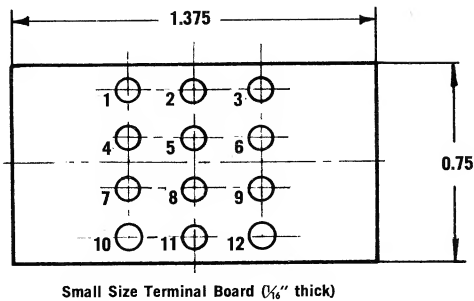


FIGURE 13 — Terminal Boards for Altec Switches

There are two sizes of terminal boards for Altec Rotary Precision Switches; one for the small size switch, and one for the large size. The small size will accommodate up to 12 connections while the large will accommodate up to 24 (including the B terminal for the ring connection). One terminal is required for each position and one for each pole on a switch deck. Thus, with a one-pole, ten-position per deck switch, a total of eleven terminals per deck are required. On a large size switch, one terminal board per deck would satisfy this requirement. For a small switch, however, two terminal boards per deck would be necessary to fulfill the circuit wir-

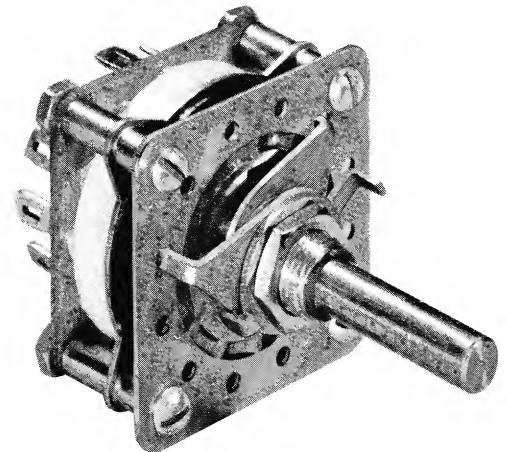
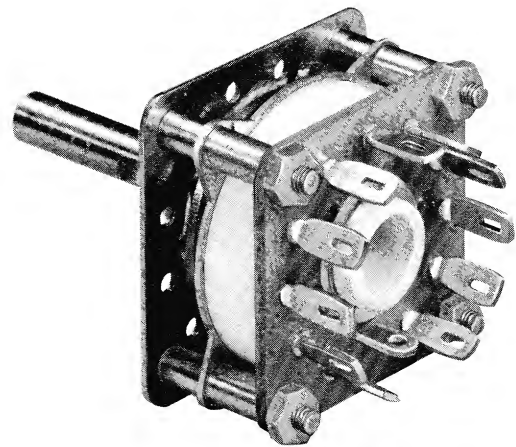


FIGURE 14

ing requirements. The selection of terminal positions is optional and the customer may specify any arrangement of terminals (within the limitations as indicated in Figure 13) which will satisfy the circuit requirements.

For example, for a small switch with a total of eleven terminals required (10 positions and one pole), the customer might prefer to use terminals 1 through 5 on one terminal board, and 1 through 5 plus terminal 10 (for the contact ring connection) on board number two. Or he might prefer one entire board (terminals 1 through 10) for position connections, reserving board two with a single terminal for the ring connection.

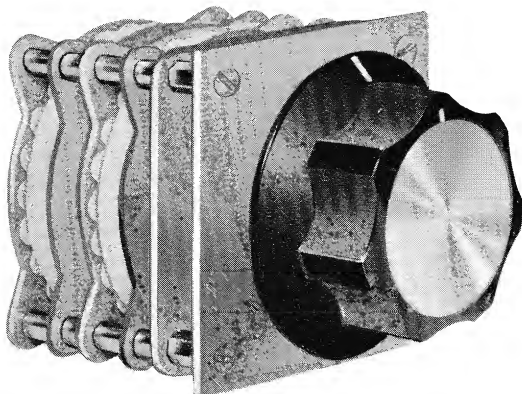


FIGURE 15A — Two Deck Switch Without Terminal Boards

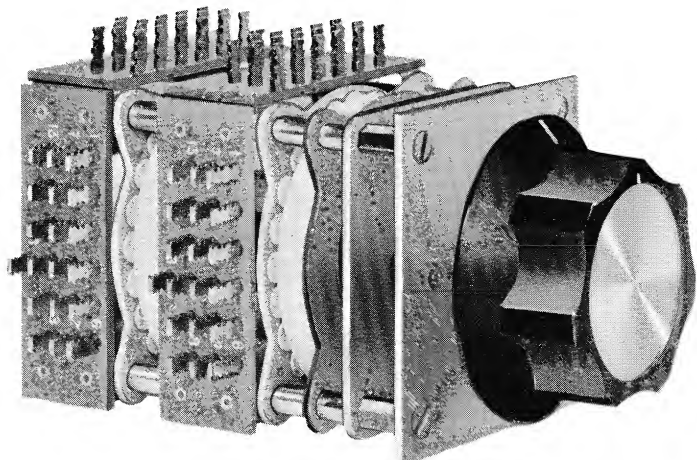


FIGURE 15B — Two Deck Switch With Terminal Boards

HOW TO ORDER AN ALTEC ROTARY PRECISION SWITCH

By combining the various components, materials and options available, it is possible to obtain an enormous variety of Altec Switches; therefore, no standard numbers have been assigned. Instead, a coded numbering system has been adopted in which each number indicates one or more specifications. When ordering, make certain that each numeral is correct as indicated in the Ordering Code (Figure 16). An error in code number will make the difference between a switch complying exactly with the desired specifications, and an unuseable one which will not satisfy all the necessary requirements.

Once the specifications of the switch have been determined, it is a simple matter to 'translate' those specifications into the correct code number for ordering. First, fill out the Altec Rotary Precision Switch Order Form (Figure 17) in accordance with the specifications as determined in the section on How To Select A Switch (page 4). The top section of the Order Form requires only a check to indicate a 'yes' or 'no' answer; the bottom section should be filled out with the correct figures or descriptions. The Order Form shown in Figure 17 has been filled out using the example cited in the section on switch selection:

non-shorting
one pole per deck
ten positions per pole
small size (with center hole mounting)
two decks,
thirty degree indexing (with audio type detents)
glass epoxy contact plates and terminal boards
two terminal boards per deck.

When the information section of the Order Form is completed, refer to the Ordering Code (Figure 15) to determine the correct number to be inserted in the "Switch Code No." line. This number has seven boxes. The first box refers to size, type of mounting and number of poles. A check on the first section

of the Ordering Code shows that—for a small, center-hole mounting switch with one pole per deck—the code number is 1. Therefore, the numeral 1 should be entered in box #1.

SWITCH CODE NO.

1		
---	--	--

 -

--	--

 -

--	--

The next box should contain the code number to indicate a non-shorting switch with audio type detenting. The code as listed in the second box shows that the number 5 is the correct code number.

SWITCH CODE NO.

1	5	
---	---	--

 -

--	--

 -

--	--

Box #3 indicates the number of decks desired: two-decks—the figure 2.

SWITCH CODE NO.

1	5	2
---	---	---

 -

--	--

 -

--	--

Boxes 4 and 5 provide information regarding the number of positions per deck. If the number of positions desired is less than 10, enter a zero (0) in box #4 and the total number of positions in box #5. In the example cited, 10 positions are required on each deck. Therefore, the figure 1 is entered in box #4 and a zero is entered in box #5.

SWITCH CODE NO.

1	5	2
---	---	---

 -

1	0
---	---

 -

--	--

(NOTE: If the number of positions is less than ten, enter a zero in box number 4. For example, for a six position switch, there should be a zero (0) in box 4 and a six (6) in box 5...

SWITCH CODE NO.

X	X	X
---	---	---

 -

0	6
---	---

 -

X	X
---	---

.)

ALTEC PRECISION SWITCHES — ORDERING CODE					
Box 1	Box 2	Box 3	Boxes 4 & 5	Box 6	Box 7
Size, Mounting & No. of Poles Per Deck	Shorting or Non-Shorting, Detents and Type	Number of Decks	Number of Positions Per Pole	Degrees Between Positions (Indexing)	Number of Terminal Boards Per Deck & Contact Plate — Terminal Board Material
Small, Center Mount, 1 pole =1	Shorting, no detents =1	(Use number desired from 1 thru 9.) For a 10 deck switch, use zero. For 11 or more the switch is special and should be so indicated by a nine (9) in box #1.	(Use the exact number desired.) If the number is less than 10, enter a zero (0) in box #4. Example: For a 6 position switch there should be a zero (0) in box 4 and a six (6) in box #5.	SHORTING TYPE 7½° =1 10° =2 11¼° † =3 15° † =4 18° =5 20° =6 22½° † =7 30° † =8	GLASS EPOXY No Terminal Boards =1 1 Terminal Board =2 2 Terminal Boards =3 3 Terminal Boards =4 4 Terminal Boards =5
Small, Center Mount, 2 pole =2	Shorting, modified hill and dale type detents =2			NON-SHORTING 15° † =1 20° =2 22½° † =3 30° † =4 36° =5 40° =6 45° =7 60° =8	
Small, Plate Mount, 1 pole =3	Shorting, modified hill and dale type detents =3				
Small, Plate Mount, 2 poles =4	Non-shorting, no detents =4				
*Large, 1 pole =5	Non-shorting, modified hill and dale type detents =5				
Large, 2 poles =6	Non-shorting, modified hill and dale type detents =5				
Large, 3 poles =7	Non-shorting, modified hill and dale type detents =6				
Large, 4 poles =8					
SPECIAL =9					
*Large switches have plate mounting only. Small switches are available with center hole mounting or plate mounting.					

FIGURE 16 — Ordering Code for Altec Switches

Indexing Angle (degrees between positions) is coded in box #6. There are two groups of code numbers for this box; one for shorting type switches, and one for non-shorting type. Be certain the proper group is used. A check of the code for the non-shorting type indicates that the figure 4 is the correct code number for a 30° indexing as cited in the example.

SWITCH CODE NO.

1	5	2
---	---	---

 -

1	0
---	---

 -

4	
---	--

The final box contains information as to the number of ter-

minal boards desired. (NOTE: Contact plates and terminal boards will be made of glass epoxy.)

SWITCH CODE NO.

1	5	2
---	---	---

 -

1	0
---	---

 -

4	2
---	---

...which completes the 'translation' process, providing the complete "Switch Code No." as it should be entered on the Order Form.

NOTE: Any unit which does not fit within the specifications becomes a 'special order' and should be indicated as such in the ordering blank by the use of the number 9 in box #1.

ALTEC ROTARY PRECISION SWITCHES				ORDER NUMBER <u>246</u>																																				
CUSTOMER'S NAME <u>AUDIBLE AUDIO</u>		DEPT. <u>X</u>	DATE <u>10-10-65</u>																																					
ADDRESS <u>112 DECIBEL DRIVE</u>		CITY & STATE <u>EXCISE, TEXAS</u>																																						
PHONE NO. <u>572-R-2</u>		DELIVERY <u>ASAP</u>																																						
SWITCH CODE NO. <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>1</td><td>5</td><td>2</td></tr></table> - <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>1</td><td>0</td></tr></table> - <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>4</td><td>2</td></tr></table>		1	5	2	1	0	4	2	QUANTITY <u>1</u>																															
1	5	2																																						
1	0																																							
4	2																																							
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 60%;"></th> <th style="width: 20%;">YES</th> <th style="width: 20%;">NO</th> </tr> <tr><td>MTG. CENTER HOLE*</td><td style="text-align: center;">✓</td><td></td></tr> <tr><td>MTG. PLATE</td><td></td><td style="text-align: center;">✓</td></tr> <tr><td>SHORTING</td><td></td><td style="text-align: center;">✓</td></tr> <tr><td>NON-SHORTING</td><td style="text-align: center;">✓</td><td></td></tr> <tr><td>DETENTS</td><td style="text-align: center;">✓</td><td></td></tr> <tr><td>TERMINAL BOARDS**</td><td style="text-align: center;">✓</td><td></td></tr> <tr><td>DIAL***</td><td></td><td style="text-align: center;">✓</td></tr> <tr><td>STANDARD SHAFT LENGTH</td><td style="text-align: center;">✓</td><td></td></tr> <tr><td>FLATS</td><td></td><td style="text-align: center;">✓</td></tr> <tr><td>KNOB</td><td></td><td style="text-align: center;">✓</td></tr> <tr><td>PLUG</td><td></td><td style="text-align: center;">✓</td></tr> </table>		YES	NO	MTG. CENTER HOLE*	✓		MTG. PLATE		✓	SHORTING		✓	NON-SHORTING	✓		DETENTS	✓		TERMINAL BOARDS**	✓		DIAL***		✓	STANDARD SHAFT LENGTH	✓		FLATS		✓	KNOB		✓	PLUG		✓	<p>FLATS</p> <p>Flat shown at 0° reference</p> <p>Indicate where flat is to be located from 0° position in a CW direction (and with the switch against the stop in the extreme CW position) by showing the flat and noting the degrees. Sample shows flat at 90°.</p> <div style="display: flex; align-items: center;"> <div style="margin-left: 10px;"> <p>Sample: Flat shown at 90°</p> </div> </div> <p>SHAFT LENGTH</p> <p>Standard shaft length is 0.93". If a different length is required, indicate the length in the space provided in accordance with the type of mounting preferred.</p> <div style="display: flex; justify-content: space-around;"> </div>			
	YES	NO																																						
MTG. CENTER HOLE*	✓																																							
MTG. PLATE		✓																																						
SHORTING		✓																																						
NON-SHORTING	✓																																							
DETENTS	✓																																							
TERMINAL BOARDS**	✓																																							
DIAL***		✓																																						
STANDARD SHAFT LENGTH	✓																																							
FLATS		✓																																						
KNOB		✓																																						
PLUG		✓																																						
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>SIZE</td><td><u>1 1/2" small</u></td></tr> <tr><td>NUMBER OF POLES PER DECK</td><td><u>1</u></td></tr> <tr><td>NUMBER OF DECKS</td><td><u>2</u></td></tr> <tr><td>NUMBER OF POSITIONS PER DECK</td><td><u>10</u></td></tr> <tr><td>INDEXING (DEGREES BETWEEN POSITIONS)</td><td><u>30°</u></td></tr> <tr><td>NUMBER OF TERMINAL BOARDS PER DECK</td><td><u>2</u></td></tr> <tr><td>CONTACT PLATE-TERMINAL BOARD MATERIAL</td><td><u>GLASS EPOXY</u></td></tr> <tr><td>DETENT TYPE</td><td><u>AUDIO</u></td></tr> <tr><td>CUSTOMER TYPE NUMBER</td><td><u>—</u></td></tr> <tr><td>USE</td><td><u>AUDIO</u></td></tr> <tr><td>SPECIAL FEATURES</td><td></td></tr> <tr><td> </td><td></td></tr> <tr><td> </td><td></td></tr> <tr><td> </td><td></td></tr> </table>	SIZE	<u>1 1/2" small</u>	NUMBER OF POLES PER DECK	<u>1</u>	NUMBER OF DECKS	<u>2</u>	NUMBER OF POSITIONS PER DECK	<u>10</u>	INDEXING (DEGREES BETWEEN POSITIONS)	<u>30°</u>	NUMBER OF TERMINAL BOARDS PER DECK	<u>2</u>	CONTACT PLATE-TERMINAL BOARD MATERIAL	<u>GLASS EPOXY</u>	DETENT TYPE	<u>AUDIO</u>	CUSTOMER TYPE NUMBER	<u>—</u>	USE	<u>AUDIO</u>	SPECIAL FEATURES								<p style="text-align: center;">SPECIAL INSTRUCTIONS</p> <p><u>BOARD #1 - 1 THRU 5</u></p> <p><u>BOARD #2 - 1 THRU 5</u></p> <p style="text-align: center;"><u>10 FOR POLE</u></p>											
SIZE	<u>1 1/2" small</u>																																							
NUMBER OF POLES PER DECK	<u>1</u>																																							
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DETENT TYPE	<u>AUDIO</u>																																							
CUSTOMER TYPE NUMBER	<u>—</u>																																							
USE	<u>AUDIO</u>																																							
SPECIAL FEATURES																																								

*available on small size switches only.

**if terminal boards are desired, state wiring preferences under Special Instructions.

***if dial engraving is required, provide engraving information under Special Instructions.

Customer's Signature A. B. Testing

Salesman's Signature Pole Position

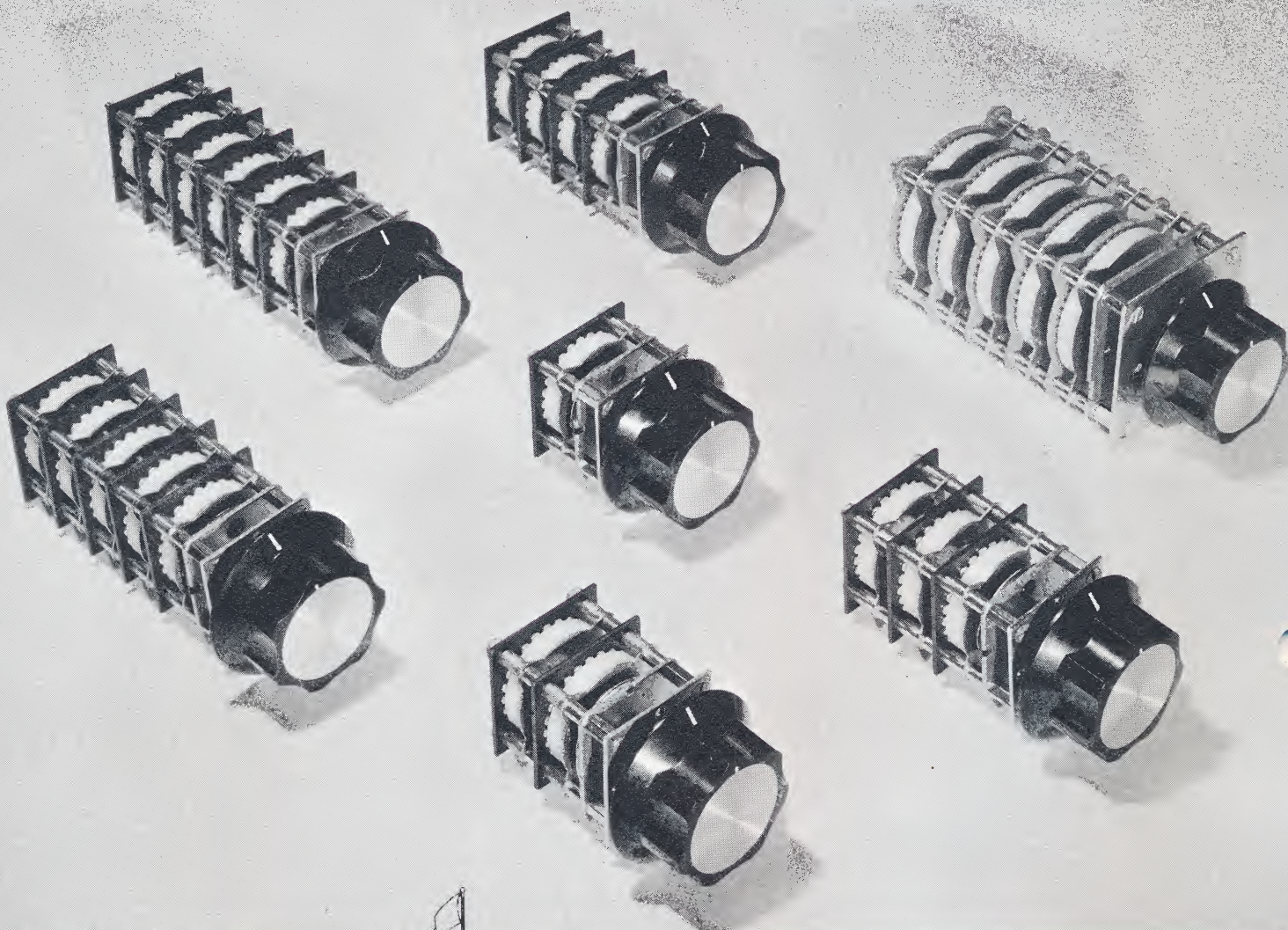
ALTEC LANSING

A DIVISION OF **57° LING ALTEC, INC.**

1515 SOUTH MANCHESTER AVENUE, ANAHEIM, CALIFORNIA 92801

774 2900 AREA CODE 714

FIGURE 17 — Switch Ordering Form



A Division of *LSV* Ling Altec, Inc.